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The Distribution of Gold Grains in Till, Sachigo River Mine, Northwest Ontario

by

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2000

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Abstract

Fifty samples of surface till were collected from a 25 km^2 area in vicinity of the Sachigo River Mine, northwest Ontario and processed for particulate gold content. The number of gold grains calculated for the till samples (normalized to 10 kg size) ranges up to 90 with a median value of 8 grains. The most frequently occurring number of calculated grains (mode) is three. Gold grains are classified mainly as reshaped although samples containing anomalous numbers of grains tend to have a high proportion of pristine grains.

Samples containing anomalous numbers of gold grains are associated with an oval tonalite pluton and parts of the Ellard greenstone belt 1 km and 4 km southwest of the Sachigo River Mine, respectively. A more detailed till sampling survey is required to detect a discrete gold grain dispersal train from the narrow, high-grade No. 2 vein that was the orebody for the Sachigo River Mine.

Anomalous numbers of gold grains in till within the general area of known mineralization support the use of till as a sampling medium for mineral exploration programs. Till is widely distributed in the Sachigo River Mine area and is conducive to local and regional till sampling surveys. Areas of thin till, where samples can be taken close to bedrock are best suited for sampling programs. Gold grain shape data can be used to help interpret the transport history of the grains.

Introduction

The Sachigo River Mine represents one of the most remote and highest grade gold deposits in Ontario. Located 410 km north-northeast of Red Lake Ontario, the Sachigo River Mine produced 1 635 kg Au and 191 kg Ag from 42 146 tonnes of ore between 1938 and the end of 1941 (Edwards 1944) with an average grade of 38.8 g/tonne Au. Although the area of the former mine site has been prospected, diamond drilled and geophysically surveyed (assessment files, Red Lake Resident Geologist's Office), no new economically viable ore bodies have been identified since closure of the mine. A general lack of bedrock exposure in the area has hindered exploration.

In August 1999, a till sampling survey was done over an approximately square area that includes and extends up to 6 km southwest of the mine site. A total of 50 till samples were collected and processed for gold grains. Goals of the work are: 1) to determine if a glacially dispersed anomaly of gold grains can be detected in the area of the mine site by till sampling; 2) to characterise background and anomalous gold grain counts in till of the area and 3) broadly to evaluate whether a till sampling survey is a useful method for gold exploration in the area. Results of the work are discussed here.

Regional Geology

The bedrock geology of the northern Superior Province in Ontario in vicinity of the Manitoba-Ontario boundary was mapped previously by Mean (1937), Satterly (1937) and Bennett and Riley (1969) and is being re-examined (Stone, Hallé and Lange 1999 and references therein). The current bedrock mapping is focused on a 120 km-long, north-south transect across a series of east-southeast trending greenstone belts interspersed with plutonic areas and major faults at the rim of the Superior Province (Figure 1).

Although extensive over distances of up to 300 km, the greenstone belts are typically narrow (1 to 10 km-wide) and variably curved, tapered or bifurcated and locally intruded by oval to elongate plutons. From south to north, these include greenstone belts at Ponask-Sachigo Lakes (Figure 1), Stull Lake, Ellard Lake and Yelling Lake. Mafic metavolcanic rocks that originated as submarine lava flows and gabbro dikes and sills are the predominant lithologic component of greenstone belts. Intermediate to felsic, commonly fragmental volcanic rocks and clastic metasedimentary rocks typically comprise subsidiary parts of greenstone belts.

The Ponask-Sachigo belt is unique by virtue of fairly abundant komatiitic rocks and rare marble and tonalite conglomerate. Detrital zircons in the conglomerate and zircon in quartz porphyry cutting mafic metavolcanic rocks are dated at 2.87 and 2.86 Ga, respectively (Davis and Moore 1991). Supracrustal sequences at Stull Lake comprise the widest (12 km) and most lithologically diverse greenstone belt in the area. In addition to sequences of mafic pillowed metavolcanic rocks provisionally correlated with the 2.83 Ga Hayes River Group (Syme et al. 1997) and turbiditic sediments, the Stull Lake greenstone belt also contains alkaline volcanics and coarse conglomerate characteristic of alluvial to fluviatile deposits of the Oxford Lake Group. Age determinations of 2.73 Ga and 2.71 Ga for dacitic tuff and crosscutting tonalite (Corkery and Skulski, 1998; Davis and Moore, 1991) possibly constrain the age of the Oxford Lake Group at Little Stull Lake. These sequences are closely associated with splays of the Stull-Wunnummin fault.

The Ellard Lake greenstone belt, which hosts the Sachigo River Mine extends east-southeast from Little Stull Lake over a distance of 130 km and attains a width ranging from 4 to 7 km. It is composed primarily of mafic pillowed lavas and thin, commonly central units of felsic volcanics and clastic metasedimentary rocks. Felsic volcanic rocks at Ellard Lake are dated at 2.73 Ga (Davis 1999). Coarse conglomerate west of Ellard Lake is possibly representative of sequences of the Oxford Lake Group such as at Stull Lake. Four oval plutons, which range in diameter from 15 to 1 km have intruded the Ellard greenstone belt between Little Stull Lake and Sherman Lake.

The narrow (1 to 2 km-wide) Yelling Lake greenstone belt is strongly deformed by the North Kenyon fault and bifurcates into several arms to the east (Figure 1). It is composed of mafic flows, thin argillaceous sediments and rare intermediate to felsic volcanic rocks.

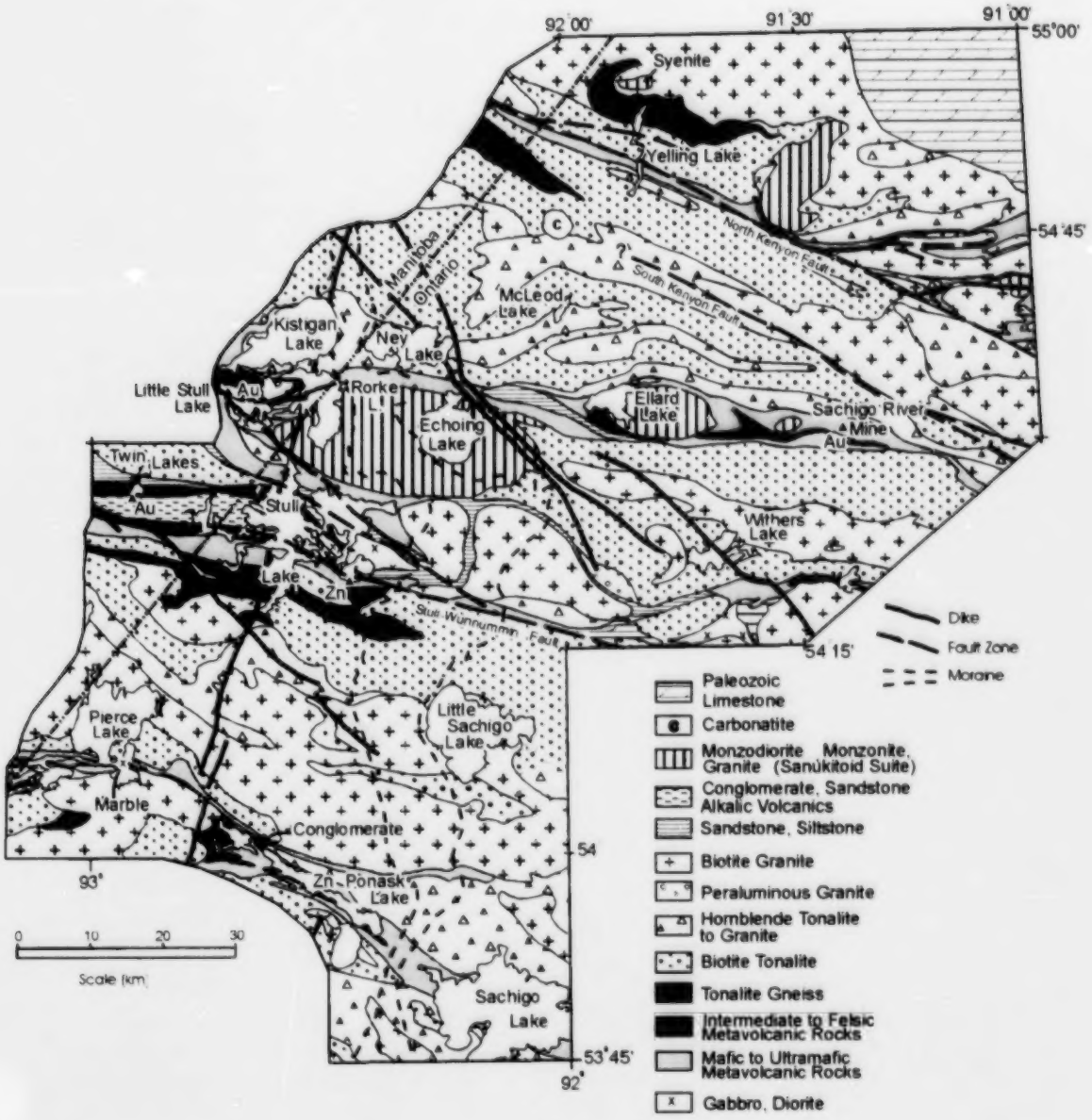

Figure 1: Regional geology of the northern Superior Province, Sachigo River Mine Area.

Felsic plutonic rocks underlie approximately 80% of the area and are subdivided into six suites (Figure 1). The biotite tonalite, hornblende tonalite to granite and biotite granite suites are volumetrically dominant occurring as broad oval to elongate batholiths and complexes. The heterogeneous sanukitoid suite (Shirey and Hanson 1984) is represented by oval plutons that can be compositionally variable from monzodiorite and monzonite to granite. Volumetrically minor belts and inclusions of tonalite gneiss occur at scattered localities. Small lenses of peraluminous (S-type) granite are associated with metasediments in the Stull and Ponask-Sachigo belts.

Sm-Nd data and geochronology permit subdivision of the region into three major fault-bounded blocks. South of the Stull-Wunnummin fault, plutonic rocks have negative ε_{Nd} values (-0.0 to -2.2) and the biotite tonalite and tonalite gneiss suites have U-Pb magmatic ages of 2.85 and 2.86 Ga and are cut by 2.73 Ga biotite granite (Skulski et al. 1999 and unpublished data). Xenocrystic zircon cores with ages of 2.9 Ga are found in one sample of biotite tonalite. Between the Stull-Wunnummin fault and North Kenyon fault, plutonic rocks have mainly positive ε_{Nd} values (-.7 to +1.5) and U-Pb magmatic ages of 2.71 and 2.75 Ga with no evidence of zircon cores. A sample of peraluminous granite is exceptional with an ε_{Nd} value of -3.7. North of the North Kenyon fault, plutonic rocks have strongly negative ε_{Nd} values (-0.1 to-7.8) and intrusions of tonalite gneiss and biotite granite have magmatic ages of 2.83 and 2.85 Ga, respectively with local xenocrystic cores as old as 3.6 Ga. These data are interpreted to represent a south to north arrangement of Mesoarchean, Neoarchean and Paleoarchean crustal blocks separated by the Stull-Wunnummin and North Kenyon faults (Skulski et al 1999).

Proterozoic magmatism in the northern Superior transect area is represented by north and northwest trending mafic dikes and an oval carbonatite intrusion north of McLeod Lake (Sage 1987). Fine grained, tan, thinly bedded bioclastic Ordovician limestone of the Hudson Bay Lowland overlies Precambrian rocks at the north end of the transect area.

Geology of the Sachigo River Mine Area

The Sachigo River Mine is situated in the Ellard greenstone belt 1 km north of Sherman Lake. In this area (Figure 2), the Ellard greenstone belt is composed primarily of pillowed mafic volcanic flows and massive amphibolite representative of either massive flows or gabbro intrusions. A pillowed flow from the mine site has an assemblage of amphibole+plagioclase+biotite+zoesite+titanite.

On the south shore of Sherman Lake, pillows face north whereas north of Sherman Lake the pillows face south and imply a synclinal structure to the greenstone belt. A narrow (.5 km-wide) unit of intermediate to felsic metavolcanic rocks and metasediments including conglomerate is interpreted to extend easterly through the centre of Sherman Lake on the basis of exposures of these rocks to the west and to the east at the outlet of Sherman Lake. Lenses of quartz and feldspar porphyritic felsic rock that can be of either intrusive or extrusive origin are conformable with mafic flows south of Sherman Lake. Dikes and irregular masses of biotite tonalite and biotite granite intrude the north side of the greenstone belt 3 km northeast of Sherman Lake.

A heterogeneous oval stock intrudes the centre of the Ellard Lake greenstone belt on the north shore of Sherman Lake. The stock varies compositionally from metagabbro at the rim through diorite to tonalite at the core and shows evidence of greenschist alteration. Mafic rim phases contain an assemblage of amphibole+20% plagioclase+ ilmenite+chlorite. The tonalitic core is composed of plagioclase+quartz+biotite+ epidote+muscovite+calcite.

The mineralized vein at the north side of Foster Lake, which represents the orebody for the Sachigo River Mine (No 2 vein; Figure 2) is not exposed and was originally discovered by diamond drilling (Edwards 1944). During the mining operation, a trench was excavated to the bedrock surface and demonstrated that the vein subcrops beneath the overburden (Edwards 1944). The vein extends discontinuously with a trend of 100° for a length of 170 m and is inclined steeply to the south. It is spatially associated with an en echelon series of brown-weathered tonalite dikes that intrude the contact of fine-grained and coarse-grained flows.

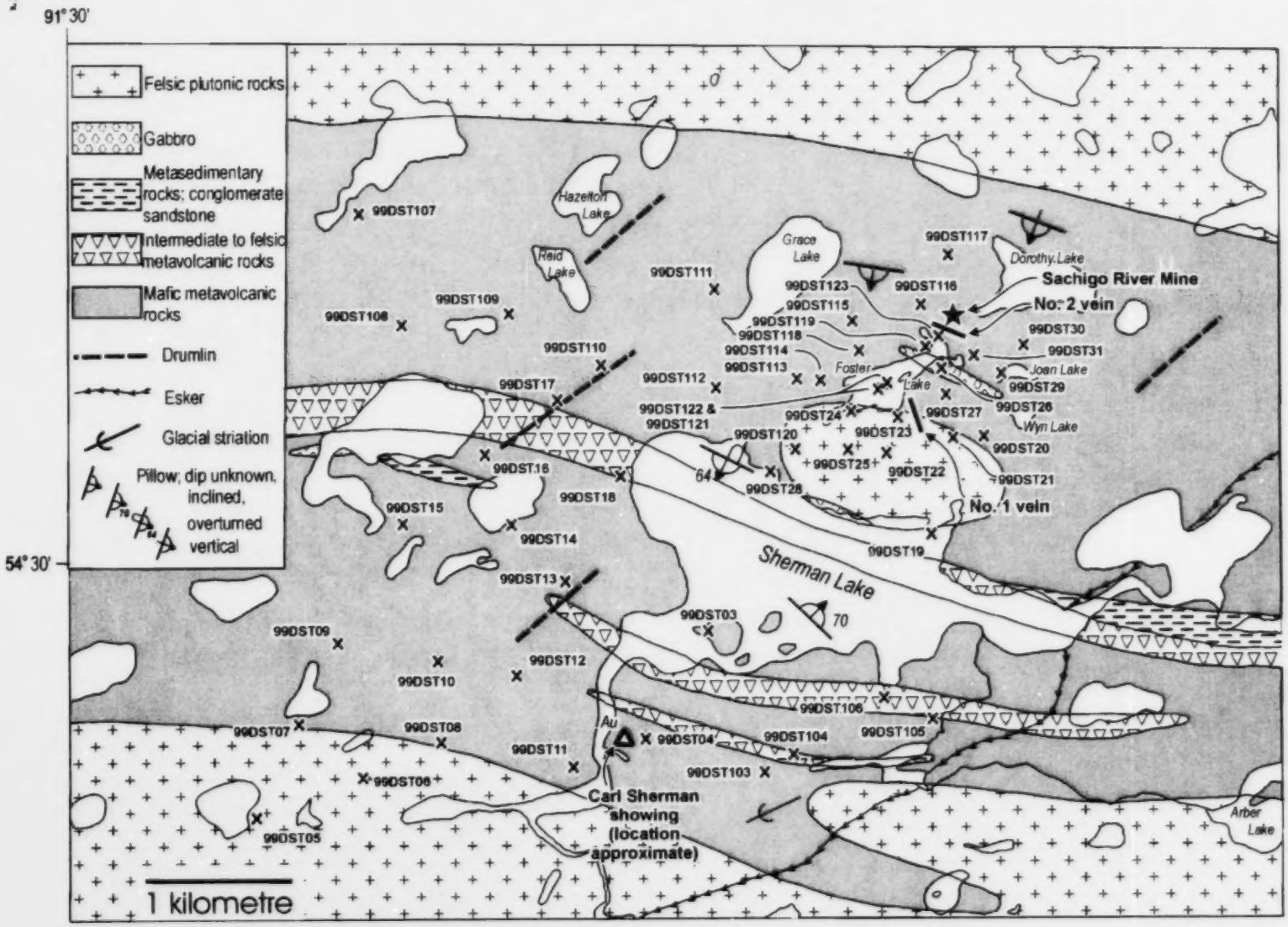

Figure 2: Local geology and till sample sites, Sachigo River Mine

Edwards (1944) reported other gold occurrences including the No. 1 vein on the south side of Foster Lake (Figure 2) and a showing on the south side of Sherman Lake. The No. 1 vein consists of sugary quartz up to .7 m wide mineralized with chalcopyrite and gold up to 10 300 ppb (.3 oz per ton). This vein was extensively trenched and drilled by early prospectors and traced in a direction of 330° for a distance of 150 m but was not mined. Edwards (1944) reported that Carl Sherman, one of the first prospectors in the area obtained "small values in gold" from oxidized outcrops of schistose rock on the south shore of Sherman Lake. The veins and the Sherman Lake showing were not observed during the present survey.

Quaternary Geology

The area surrounding the Sachigo River Mine is a low-relief plain standing 205 m above sea level and sloping gently to the northeast. A series of southwesterly-trending drumlinoid ridges are the main topographic features locally rising 20 m above the peneplain.

Bedrock of the area is blanketed by thin till and peat deposits. Till thickness is typically less than 2 m but may locally increase to 20 m within the drumlins. Organic deposits are less than .5 m thick on well drained till but can exceed 2 m thickness at the margins of muskeg swamps. Low-lying areas commonly develop ground-ice mounds and ridges up to 2 m high.

Several prominent drumlins occur north and west of Sherman Lake (Figure 2). A narrow, sinuous and discontinuous esker extends southwesterly at the east end of Sherman Lake. Flat, thick deposits of glaciofluvial outwash flank the esker locally. Glaciolacustrine deposits are rare in the area with the possible exception of non-stratified silt encountered in test pits on islands in Sherman Lake.

Ice-sculptured landforms and glacial striae indicate a fairly consistent pattern of late glacial ice flow directed toward the southwest, which is characteristic of a large area east of the Sachigo moraine (Barnett 1992). The intensity of this event is manifest by the presence of southwesterly oriented lakes, drumlins and roche moutonées.

Till in the area of the Sachigo River Mine is tan-brown, silty and moderately well compacted. Weathering generally extends to a depth of .3 m. Till is commonly capped by thin lag gravel deposits and organic material. Coarse sand to pebble-sized clasts in the till are composed, on average, of about 50% limestone fragments with the remainder made up of mixed Archean plutonic and supracrustal material.

Sample Collection and Processing

Of the 50 samples, whose locations are listed in Appendix A and shown in Figure 2, 45 are till and the remainder are beach deposits or sandy glaciolacustrine or glaciofluvial lenses on the bedrock surface. Till and sand samples were collected primarily from well drained areas in the general vicinity of outcrops and by digging through muskeg. Samples of beach deposits were obtained from the boulder shoreline areas of small lakes. The regional sampling grid contains an average density of 2 samples per square kilometer although samples are concentrated "down ice" from the Sachigo River Mine in the area of Foster Lake (Figure 2).

Approximately 10 kg of material was collected at each site from shallow (~1 m deep) hand-dug pits. Samples were collected from the till-bedrock interface or from as deep as possible in areas of thick till. Cobbles and organic material were removed from samples in the field.

Samples were processed by Overburden Drilling Management Ltd of Nepean, Ontario. The -2 mm sample fraction is passed over a shaking table to produce a "table concentrate" of heavy minerals. At the tabling stage, a preliminary count of gold grains including size and shape determinations is undertaken. The "table concentrate" is subsequently panned and examined under a microscope to provide a refined

count of gold grains as well as a characterization of grain shapes. Gold grains are subsequently returned to the "table concentrate" from which a heavy mineral concentrate (HMC) with a specific gravity greater than 3.2 is produced by gravity settling in methylene iodide and removal of magnetic grains with an automagnet. The HMCs are retained and archived.

Appendix B lists sample weights and characteristics of the table concentrates including the total number of gold grains (NO. V.G.) and the calculated concentration of gold (CALC PPB) in the non-magnetic table concentrate (NON MAG). Calculation of the concentration of gold is made possible by estimating the size and weight of gold grains under a microscope. Appendix C provides a classification of the gold grains in each sample according to their shape as well as the calculated concentration of gold in parts per billion for each type of grain shape.

The shapes of gold grains are classified as pristine, modified or reshaped according to DiLabio (1990). Pristine grains have block, rod, wire, leaf, crystal, star and globule shapes and surfaces that are typically smooth with sharpe edges and showing grain moulds. These delicate grains appear not to have been damaged by glacial transport. Modified grains show a range of shapes comparable to that of pristine grains but typically have bent, blunted or thickened edges of leaves and wires and grain surfaces can be striated or felty. Reshaped grains have the form of well-rounded nuggets or folded rods, wires and flakes whose surfaces are striated or pitted. The progression from pristine through modified to reshaped grains reflects increasing modification to gold grains either due to glacial or fluviatile transport or weathering. In the case of tills, the transition from pristine through modified to reshaped grains may be interpreted as a qualitative representation of the distance of glacial transport from source (Averill, 1988; DiLabio 1990).

Results

Gold mineralization at the Sachigo River Mine is hosted by the No. 2 quartz vein that is typically narrow (<0.5 m-wide) and is associated with a sheared tonalite dike in mafic metavolcanic rocks. Edwards (1944) noted three generations of quartz in the mineralized vein. The highest grade of gold occurs in an early dark blue-grey variety of quartz that is usually found in small lenses. In this setting:

"Gold was deposited in an extremely finely divided state close to the contacts of the vein and along stress lines in the quartz paralleling the plane of the lens. This type of quartz invariably showed a plentiful supply of associated sulphides including pyrite, sphalerite, pyrrhotite and galena. Individual specimens of the blue quartz gave consistent assays of up to 25 ounces per ton, and generally speaking could be relied upon to run from 3 to 5 ounces per ton or higher. The second, and a later, type of quartz was dense grey or white variety, occurring in wider lenses of considerable extent (widths of 6 or 8 feet horizontal and vertical extent 100 to 150 feet). Here too, gold was finely disseminated and concentrated close to the contacts. Mineralization was fairly plentiful and consisted of pyrite, chalcopyrite, pyrrhotite and rarely sphalerite and galena. This type of quartz rarely exceeded one ounce per ton in value and its grade could be reliably estimated at from 0.50 ounces per ton to the above figure."

A third type of quartz, which is voluminous and glassy is weakly and erratically mineralized with coarse flakes of gold near the contacts of the vein with tonalite (Edwards 1944).

From Appendix D, it can be seen that the weight of the till samples (Table Feed) typically ranges between 6 and 9 kg. In order to provide meaningful comparisons of the number of gold grains from sample to sample, it is necessary to recalculate or normalize the number of gold grains to a constant sample size. In this case, a 10 kg sample size is used. Figure 3 highlights results of the recalculated gold grain counts in till samples of the Sachigo River Mine area. Several observations can be made from inspection of Figure 3 and analysis of the gold grain tables (Appendices B, C and D).

1) The largest anomalies are found in the area of the oval tonalite pluton between Foster Lake and Sherman Lake and at one site southwest of Sherman Lake in the area of the Carl Sherman showing. The anomalies include one sample (#28) which is representative of beach sand from the shoreline of Sherman Lake.

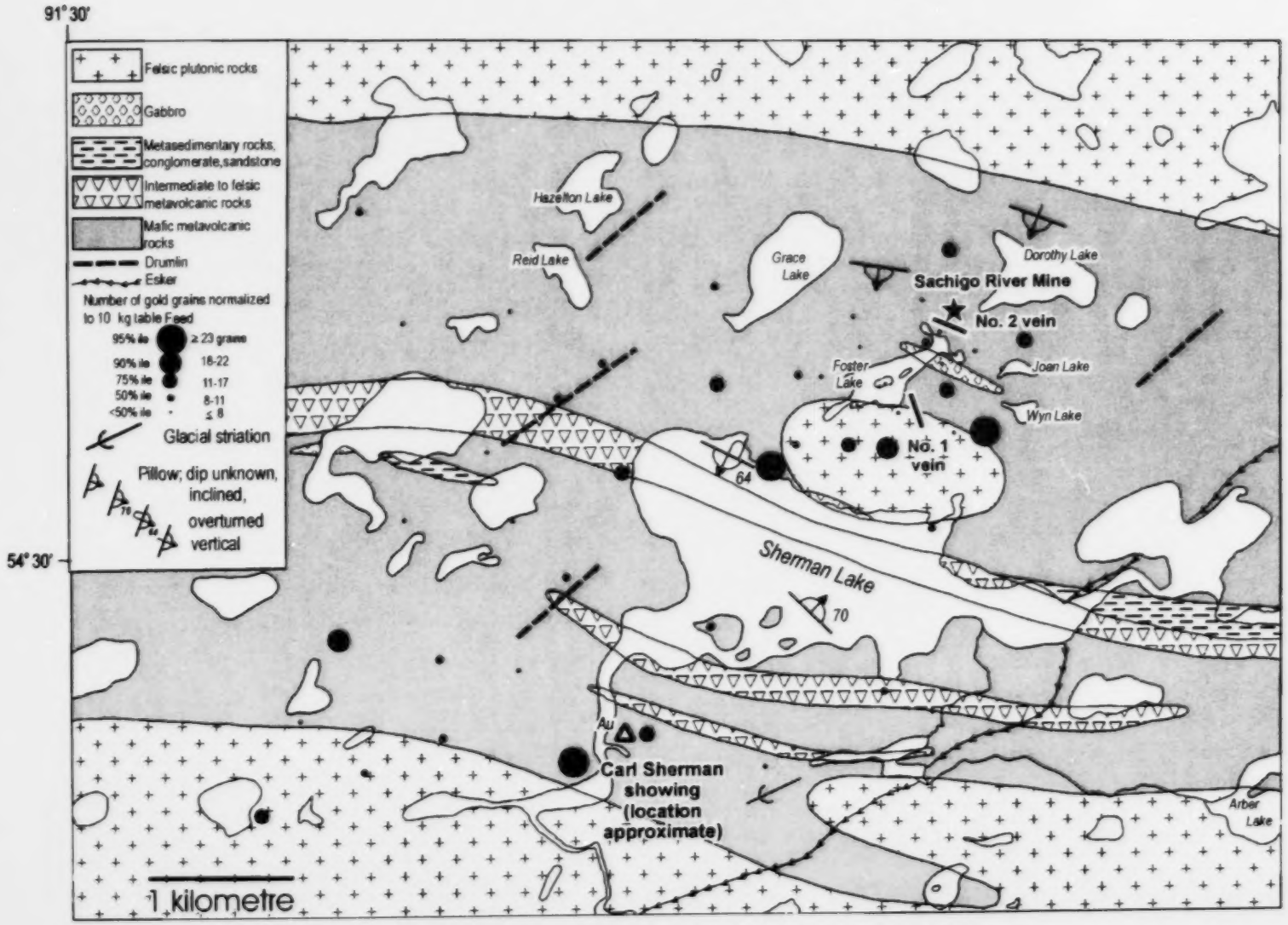

Figure 3:Distribution of particulate gold in till, Sachigo River Mine.

2) In general, anomalous gold grain counts show weak alignment in a southwesterly direction, which coincides with the direction of glacial advance. Additional samples in the "up ice" direction and east of the present survey area are required to confirm this hypothesis and to verify that anomalies are associated with the oval tonalite pluton.

3) The current survey does not clearly define a dispersal train from the No. 2 vein. More detailed sampling in the area of the No. 2 vein is required to more clearly define dispersal patterns.

4) The number of gold grains found in each sample (normalized to a ten-kilogram sample size) ranges between 0 and 90 grains with a median value of 8 grains.

5) The majority of gold in the till samples occurs as small reshaped flakes with dimensions seldom exceeding 200 microns and typically on the order of 25 x 75 x 10 microns.

6) Although generally rare, pristine gold grains are concentrated in samples that have the highest overall gold grain counts including samples 20, 28, 4, 9 and 119.

Discussion

An objective of the till sampling survey is to determine if an anomalous zone of glacially dispersed gold grains could be detected "down ice" from the No. 2 vein. Till sampling surveys in other glaciated areas of the Canadian Shield (e.g. Bajc 1997) indicated that levels of gold in till usually decline rapidly to background values within a few hundred meters of known gold deposits. In this case, thick overburden, tailings and the northwest-trending arm of Foster Lake have prevented sampling on the bedrock surface within about 200 meters of the No. 2 vein. Further, based on the descriptions of Edwards (1944), the majority of gold is concentrated in small lenses of blue quartz, which would tend to produce a local anomaly possibly showing an extreme "nugget effect" in dispersed till. That is, the number of gold grains in till close to the No. 2 vein might be very high or low depending on whether or not the till contained a disaggregated remnant of the mineralized blue quartz. Sample 119, which is located about 300 m "down ice" from the No. 2 vein contains 5 pristine gold grains and 3 reshaped grains, the former of which could have possibly originated from the No 2 vein. In comparison with the number of pristine gold grains found in other samples, the gold content of sample 119 is not sufficiently high to constitute a reliable indicator of mineralization nearby. We conclude that a more detailed sampling survey is required to define a dispersal train associated with the No. 2 vein.

A second objective of the survey is to establish background and anomalous levels of gold in till of the Sachigo River Mine area. The median value of calculated gold grains is 8 and is possibly representative of background however this value may be high since the sampling was done over an area of known mineralization. The most frequently occurring value of 3 grains may provide a better estimate of background values since this is the number of gold grains typically found in samples from large parts of the study area away from known mineralization (Figure 3). Further sampling over a larger area is required to accurately define background gold grain counts. The number of gold grains in three samples (#s 20, 28 and 11) exceeds the number of grains in 94% of the samples. These, and a fourth sample (#9) contain 22 or more calculated gold grains and are regarded as anomalous at the 92% confidence level.

The till sampling survey has identified anomalous numbers of gold grains in parts of the Sherman Lake area. For example, more than 46 calculated grains including abundant pristine grains are found in samples 20 and 28 that appear to be associated with the oval tonalite pluton between Foster and Sherman Lakes. Samples 9 and 11 contain 22 and 23 calculated grains respectively, and may indicate other sources for gold grains southwest of Sherman Lake. Hence, till sampling at a density of approximately 2 samples per square kilometer appears to be a useful exploration tool at a reconnaissance stage for detection of gold mineralization. More detailed surveys are required to identify small targets such as the No. 2 vein.

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Appendix A: Sample locations (UTM coordinates) and sample descriptions

Sample No	Area	Easting	Northing	Sample Description
99DST03	Sherman L	601450	6039600	Tan brown silty till (1m depth) on .1m red sand on bedrock
99DST04	Sherman L	601000	6039000	Tan brown silty till (.3m depth) on bedrock beneath muskeg
99DST05	W. Sherman	598400	6038200	Tan silty till, 1m depth on flank of drumlin
99DST06	W. Sherman	599100	6038500	Silty till, .5m deep on flank of drumlin
99DST07	W. Sherman	598800	6038900	Pebbly silty till, 1m depth beneath .4m peat
99DST08	W. Sherman	599700	6038800	Tan silty till beneath muskeg
99DST09	W. Sherman	598950	6039600	Two layers of tan silty till separated by .1m organic horizon (.4 m and .7 m depth) on bedrock
99DST10	W. Sherman	599700	6039400	Tan silty till .6m depth beneath dry muskeg
99DST11	W. Sherman	600700	6038600	Red sandy till below grey silt on berock, .5m depth
99DST12	W. Sherman	600200	6039250	Silty till, tan brown, 1m depth below .3m, peat in dry muskeg on drumlin. Limestone, greenstone and granite cobbles.
99DST13	W. Sherman	600600	6040100	Tan silty till .7m near crest of drumlin
99DST14	W. Sherman	600200	6040300	Grey limey beach deposit .3m under water among boulders in lake
99DST15	W. Sherman	599550	6040400	Tan silty till 1m depth at down ice end of drumlin
99DST16	W. Sherman	599950	6040800	Tan silty till 1m depth at down ice end of drumlin
99DST17	NW Sherman	600500	6041200	Tan silty till .5m depth beneath .2m red oxidized layer; well-drained soil at nose of drumlin
99DST18	W. Sherman	600850	6040800	Tan pebbly till with brown oxidized zones .6m depth in dry muskeg with boulders
99DST19	Sherman L	602950	6040400	Silty grey beach deposit .3m below water on greenstone bedrock
99DST20	N. Sherman	603300	6041000	Red weathered silty till, .02m above bedrock, .4m depth, mostly greenstone clasts
99DST21	N. Sherman	603100	6040950	Red-grey gritty silt in bedrock crevasse .3m depth; pebbles of greenstone, granite and limestone
99DST22	N. Sherman	602700	6040900	Black gritty horizon .8m depth at interface of overlying peat with underlying silt. Greenstone, diorite, limestone and granite clasts
99DST23	Foster L	602800	6041100	Red sandy grit on diorite .3m depth
99DST24	Foster L	602400	6041100	Red sandy grit on diorite beneath muskeg .4m depth
99DST25	N. Sherman	602400	6040900	Grey silty till .8m depth on bedrock or large boulder beneath .5 m black muskeg. Volcanic, limestone and diorite clasts
99DST26	Foster L	603050	6041500	Red oxidized till on bedrock beneath overturned tree, .3m
99DST27	S. Foster L	603050	6041200	Red weathered till on bedrock in crevasse .4m depth
99DST28	Sherman L	602150	6040500	Very silty lake sediments on flank of outcrop .6m depth + 2 scoops of sand from the lake at .3 m depth
99DST29	E. Foster	603500	6041500	Red gritty till in bedrock crevasse beneath overturned root, .6m
99DST30	E. Foster	603700	6041700	Grey, silty till beneath .4m peat near outcrop .5 to 1m depth in two pits. Limestone and greenstone clasts
99DST31	E. Foster	603300	6041650	Coarse grit in bedrock crevasse .8m beneath grey till and organics
99DST103	S. of Sherman L	601872	6038654	Silty till near greenstone outcrop, heavy to pebbles (20%)
99DST104	S. of Sherman L	602050	6038000	Glacial silty till, SW of intermediate volcanic outcrop; 40% sand
99DST105	S. of Sherman L	603004	6039060	Silty till with sand, SW of intermediate volcanic outcrop
99DST106	S. of Sherman L	602678	6039191	Till with sand SW of intermediate volcanic outcrop
99DST107	NW of Sherman L	599079	6042425	Silty till with grit up to .01 m on west side of drumlins
99DST108	NW of Sherman L	599392	6041663	Silty till with grit up to .005 m from drumlin
99DST109	NW of Sherman L	600104	6041757	Silty till with <.005m grit, east of drumlin
99DST110	NW of Sherman L	600736	6041417	Silty till with 45% sand/pebbles/stones, W. side of drumlin
99DST111	N. of Sherman L	601493	6041963	Silty till, S. of drumlin, with grit
99DST112	N. of Sherman L	601512	6041288	Silty till with 30% sand/pebbles, underneath cobble layer
99DST113	N. of Sherman L	602066	6041363	Silty till
99DST114	N. of Sherman L	602225	6041353	Silty till with grit (<.005m) beneath cobble layer

Appendix A: cont'd.

Sample No	Area	Easting	Northing	Sample Description
99DST115	N. of Sherman L	602441	6041775	Silty till from beneath cobble layer
99DST116	N. of Sherman L	602901	6041897	Silty till, very coarse sand & pebbles (<.005m) beneath boulders
99DST117	N. of Sherman L	603089	6042244	Silty till with very coarse grit (<.02m), beneath cobbles
99DST118	N. of Sherman L	602488	6041569	Silty till with clasts <.05m from underneath small cobbles
99DST119	N. of Sherman L	602939	6041607	Silty till, high % of greenstone cobbles, grit <.02m, SW of outcrop
99DST120	N. of Sherman L	602066	6040875	Medium grained sand, 1–2mm diameter – unknown origin
99DST121	Foster L	602627	6041293	Silty till beneath stony/cobbly layer, south of greenstone outcrop
99DST122	Foster L	602655	6041320	Sandy, brown, homogeneous till from edge of greenstone outcrop
99DST123	Foster L	603027	6041682	Silty till with pebbles to .01m, beneath stony 'desert pavement'

Appendix B: Heavy mineral weight data

SAMPLE NO.	WEIGHT (KG.WET) TABLE SPLIT	+2 mm CHIPS	TABLE FEED	TABLE CONC	WEIGHT (GRAMS DRY) M.I. LIGHTS	M.I. CONC. CONC. TOTAL	NON MAG	MAG	AU NO. V.G.	AU CALC PPB
99DST03	9.5	0.7	8.8	641.9	626.5	15.4	12.5	2.9	7	257
99DST04	9.9	1.4	8.5	661.4	621.4	40.0	35.9	4.1	11	20
99DST05	9.6	1.4	8.2	659.5	626.7	32.8	25.2	7.6	11	22
99DST06	12.3	0.8	11.5	360.7	332.5	28.2	24.7	3.5	12	76
99DST07	9.4	1.5	7.9	303.1	289.9	13.2	9.6	3.6	4	15
99DST08	10.2	1.5	8.7	333.1	292.0	41.1	31.5	9.6	8	152
99DST09	9.8	1.6	8.2	376.7	350.3	26.4	20.3	6.1	18	81
99DST10	9.7	1.4	8.3	244.9	214.1	30.8	23.2	7.6	8	20
99DST11	9.0	0.7	8.3	397.1	336.9	60.2	51.2	9.0	19	33
99DST12	9.6	1.0	8.6	228.8	204.4	24.4	18.2	6.2	3	15
99DST13	9.6	0.9	8.7	376.7	348.6	28.1	22.5	5.6	7	37
99DST14	8.8	1.8	7.0	341.8	310.9	30.9	28.4	2.5	3	10
99DST15	9.6	1.8	7.8	291.1	266.0	25.1	20.4	4.7	3	8
99DST16	9.6	1.0	8.6	432.6	401.8	30.8	24.1	6.7	4	32
99DST17	9.1	1.1	8.0	373.6	346.3	27.3	21.1	6.2	8	16
99DST18	9.1	2.3	6.8	276.1	250.2	25.9	19.5	6.4	9	16
99DST19	9.0	0.9	8.1	317.4	301.4	16.0	13.5	2.5	9	24
99DST20	8.1	0.4	7.7	300.1	290.0	10.1	10.0	0.1	69	613
99DST21	9.0	0.8	8.2	232.4	213.9	18.5	15.7	2.8	1	5
99DST22	9.5	1.7	7.8	318.1	292.4	25.7	25.4	0.3	14	35
99DST23	8.0	0.4	7.6	373.7	360.6	13.1	12.8	0.3	4	78
99DST24	8.1	0.6	7.5	347.8	337.9	9.9	9.1	0.8	2	18
99DST25	8.4	1.0	7.4	264.2	247.4	16.8	14.9	1.9	10	99
99DST26	8.5	1.7	6.8	345.2	310.0	35.2	34.2	1.0	4	20
99DST27	9.2	2.3	6.9	243.3	207.6	31.4	31.4	4.3	12	21
99DST28	8.9	0.9	8.0	263.1	252.5	10.6	8.5	2.1	37	211
99DST29	7.8	0.7	7.1	324.7	302.5	22.2	20.6	1.6	3	5
99DST30	9.2	0.9	8.3	294.1	271.2	22.9	19.2	3.7	10	78
99DST31	9.2	2.8	6.4	320.2	305.1	15.1	10.5	4.6	1	2
99DST103	9.3	2.9	6.4	337.6	305.0	32.6	24.5	8.1	2	11
99DST104	9.7	0.9	8.8	373.4	317.5	55.9	41.9	14.0	1	2
99DST105	10.4	0.8	9.6	364.3	332.8	31.5	25.2	6.3	3	7
99DST106	8.6	0.6	8.0	390.5	358.9	31.6	27.3	4.3	9	33
99DST107	8.7	1.0	7.7	322.2	299.0	23.2	18.6	4.6	2	2
99DST108	9.1	0.7	8.4	299.2	277.3	21.9	17.3	4.6	3	14
99DST109	8.2	0.7	7.5	238.1	223.8	14.3	11.6	2.7	2	39
99DST110	10.1	1.3	8.8	314.5	278.8	35.7	26.9	8.8	7	13
99DST111	8.8	1.4	7.4	348.3	316.9	31.4	24.8	6.6	7	23
99DST112	7.9	0.8	7.1	307.2	284.9	22.3	20.0	2.3	9	59
99DST113	9.7	0.6	9.1	314.0	281.3	32.7	28.9	3.8	7	35
99DST114	9.2	1.1	8.1	296.1	266.5	29.6	23.1	6.5	3	2
99DST115	9.1	0.9	8.2	286.7	266.4	20.3	15.3	5.0	6	30
99DST116	9.1	1.1	8.0	261.0	233.4	27.6	21.1	6.5	6	48
99DST117	9.8	1.2	8.6	338.6	303.9	34.7	27.3	7.4	10	32
99DST118	7.4	1.4	6.0	355.0	332.7	22.4	21.0	1.4	2	2
99DST119	7.6	0.5	7.1	273.0	252.0	21.0	19.4	1.6	8	23
99DST120	8.1	1.8	6.3	341.2	337.6	3.6	3.1	0.5	7	510

Appendix B: cont'd.

SAMPLE NO.	WEIGHT (KG.WET)				WEIGHT (GRAMS DRY)				AU	
						M.I. CONC.				
	TABLE SPLIT	+2 mm CHIPS	TABLE FEED	TABLE CONC	M.I. LIGHTS	CONC. TOTAL	NON MAG	MAG	NO. V.G.	CALC PPB
99DST121	8.6	1.3	7.3	301.4	273.8	27.6	22.8	4.8	0	0
99DST122	9.5	1.7	7.8	313.4	295.5	17.9	17.6	0.3	4	7
99DST123	7.8	0.5	7.3	372.7	336.3	36.4	29.4	7.0	4	12

Appendix C: Summary gold grain data

Sample No.	Number of Visible Gold Grains				Non-Mag Weight	Calculated PPB Visible Gold			
	Total	Reshaped	Modified	Pristine		Total	Reshaped	Modified	Pristine
99DST03	7	5	2	0	12.5	257	248	8	0
99DST04	11	3	2	6	35.9	20	4	8	8
99DST05	11	9	1	1	25.2	22	21	0	1
99DST06	12	8	1	3	24.7	76	64	8	4
99DST07	4	2	1	1	9.6	15	11	1	3
99DST08	8	7	1	0	31.5	152	149	3	0
99DST09	18	7	2	9	20.3	81	57	5	19
99DST10	8	6	2	0	23.2	20	12	9	0
99DST11	19	17	1	1	51.2	33	32	2	0
99DST12	3	2	0	1	18.2	15	15	0	0
99DST13	7	4	1	2	22.5	37	35	1	1
99DST14	3	2	1	0	28.4	10	10	0	0
99DST15	3	2	0	1	20.4	8	5	0	3
99DST16	4	3	0	1	24.1	32	30	0	2
99DST17	8	6	1	1	21.1	16	12	1	4
99DST18	9	9	0	0	19.5	16	16	0	0
99DST19	9	9	0	0	13.5	24	24	0	0
99DST20	69	3	9	57	10.0	613	54	46	513
99DST21	1	1	0	0	15.7	5	5	0	0
99DST22	14	8	0	6	25.4	35	16	0	19
99DST23	4	2	0	2	12.8	78	56	0	21
99DST24	2	2	0	0	9.1	18	18	0	0
99DST25	10	5	4	1	14.9	99	24	74	1
99DST26	4	3	1	0	34.2	20	17	2	0
99DST27	12	9	2	1	31.4	21	20	1	1
99DST28	37	6	4	27	8.5	211	28	15	168
99DST29	3	0	0	3	20.6	5	0	0	5
99DST30	10	6	1	3	19.2	78	51	4	23
99DST31	1	0	1	0	10.5	2	0	2	0
99DST103	2	2	0	0	24.5	11	11	0	0
99DST104	1	1	0	0	41.9	2	2	0	0
99DST105	3	3	0	0	25.2	7	7	0	0
99DST106	9	8	0	1	27.3	33	32	0	1
99DST107	2	2	0	0	18.6	2	2	0	0
99DST108	3	1	2	0	17.3	14	0	14	0
99DST109	2	1	1	0	11.6	39	32	7	0
99DST110	7	3	4	0	26.9	13	9	5	0
99DST111	7	5	1	1	24.8	23	13	2	8
99DST112	9	7	2	0	20.0	59	58	2	0
99DST113	7	7	0	0	28.9	35	35	0	0
99DST114	3	2	1	0	23.1	2	1	1	0
99DST115	6	3	0	3	15.3	30	19	0	11
99DST116	6	6	0	0	21.1	48	48	0	0
99DST117	10	9	0	1	27.3	32	30	0	2
99DST118	2	2	0	0	21.0	2	2	0	0
99DST119	8	3	0	5	19.4	23	5	0	18
99DST120	7	5	0	2	3.1	510	476	0	34
99DST121	0	0	0	0	22.8	0	0	0	0
99DST122	4	1	1	2	17.6	7	5	1	2
99DST123	4	4	0	0	29.4	12	12	0	0

Appendix D: Gold grain statistics

Sequence No.	Field Sample No.	Table Feed (kg)	No. Au grains (measured)	No. Au grains (calculated per 10 kg table feed)	Statistical parameters
50	99DST20	7.7	69	90	
49	99DST28	8.0	37	46	
48	99DST11	8.3	19	23	95 percentile
47	99DST09	8.2	18	22	
46	99DST22	7.8	14	18	90 percentile
45	99DST27	6.9	12	17	
44	99DST25	7.4	10	14	
43	99DST05	8.2	11	13	
42	99DST18	6.8	9	13	
41	99DST04	8.5	11	13	
40	99DST112	7.1	9	13	
39	99DST30	8.3	10	12	
38	99DST117	8.6	10	12	
37	99DST119	7.1	8	11	75 percentile
36	99DST106	8.0	9	11	
35	99DST19	8.1	9	11	
34	99DST120	6.3	7	11	
33	99DST06	11.5	12	10	
32	99DST17	8.0	8	10	
31	99DST10	8.3	8	10	
30	99DST111	7.4	7	9	
29	99DST08	8.7	8	9	
28	99DST13	8.7	7	8	
27	99DST03	8.8	7	8	
26	99DST110	8.8	7	8	
25	99DST113	9.1	7	8	50 percentile (median)
24	99DST116	8.0	6	8	
23	99DST115	8.2	6	7	
22	99DST26	6.8	4	6	
21	99DST123	7.3	4	5	
20	99DST23	7.6	4	5	
19	99DST122	7.8	4	5	
18	99DST07	7.9	4	5	
17	99DST16	8.6	4	5	
16	99DST14	7.0	3	4	
15	99DST29	7.1	3	4	
14	99DST15	7.8	3	4	
13	99DST114	8.1	3	4	
12	99DST108	8.4	3	4	
11	99DST12	8.6	3	3	
10	99DST118	6.0	2	3	
9	99DST103	6.4	2	3	
8	99DST105	9.6	3	3	mode
7	99DST24	7.5	2	3	
6	99DST109	7.5	2	3	
5	99DST107	7.7	2	3	
4	99DST31	6.4	1	2	
3	99DST21	8.2	1	1	
2	99DST104	8.8	1	1	
1	99DST121	7.3	0	0	

Metric Conversion Table

Conversion from SI to Imperial			Conversion from Imperial to SI		
SI Unit	*Multiplied by*	*Gives*	*Imperial Unit*	*Multiplied by*	*Gives*
		LENGTH			
1 mm	0.039 37	inches	1 inch	**25.4**	mm
1 cm	0.393 70	inches	1 inch	**2.54**	cm
1 m	3.280 84	feet	1 foot	**0.304 8**	m
1 m	0.049 709	chains	1 chain	20.116 8	m
1 km	0.621 371	miles (statute)	1 mile (statute)	**1.609 344**	km
		AREA			
1 cm^2	0.155 0	square inches	1 square inch	**6.451 6**	cm^2
1 m^2	10.763 9	square feet	1 square foot	**0.092 903 04**	m^2
1 km^2	0.386 10	square miles	1 square mile	2.589 988	km^2
1 ha	2.471 054	acres	1 acre	0.404 685 6	ha
		VOLUME			
1 cm^3	0.061 023	cubic inches	1 cubic inch	**16.387 064**	cm^3
1 m^3	35.314 7	cubic feet	1 cubic foot	0.028 316 85	m^3
1 m^3	1.307 951	cubic yards	1 cubic yard	0.764 554 86	m^3
		CAPACITY			
1 L	1.759 755	pints	1 pint	0.568 261	L
1 L	0.879 877	quarts	1 quart	1.136 522	L
1 L	0.219 969	gallons	1 gallon	**4.546 090**	L
		MASS			
1 g	0.035 273 962	ounces (avdp)	1 ounce (avdp)	28.349 523	g
1 g	0.032 150 747	ounces (troy)	1 ounce (troy)	**31.103 476 8**	g
1 kg	2.204 622 6	pounds (avdp)	1 pound (avdp)	**0.453 592 37**	kg
1 kg	0.001 102 3	tons (short)	1 ton (short)	**907.184 74**	kg
1 t	1.102 311 3	tons (short)	1 ton (short)	**0.907 184 74**	t
1 kg	0.000 984 21	tons (long)	1 ton (long)	**1016.046 908 8**	kg
1 t	0.984 206 5	tons (long)	1 ton (long)	**1.016 046 90**	t
		CONCENTRATION			
1 g/t	0.029 166 6	ounce (troy)/ ton (short)	1 ounce (troy)/ ton (short)	34.285 714 2	g/t
1 g/t	0.583 333 33	pennyweights/ ton (short)	1 pennyweight/ ton (short)	1.714 285 7	g/t

OTHER USEFUL CONVERSION FACTORS

	Multiplied by	
1 ounce (troy) per ton (short)	31.103 477	grams per ton (short)
1 gram per ton (short)	0.032 151	ounces (troy) per ton (short)
1 ounce (troy) per ton (short)	20.0	pennyweights per ton (short)
1 pennyweight per ton (short)	0.05	ounces (troy) per ton (short)

Note: Conversion factors which are in bold type are exact. The conversion factors have been taken from or have been derived from factors given in the Metric Practice Guide for the Canadian Mining and Metallurgical Industries, published by the Mining Association of Canada in co-operation with the Coal Association of Canada.